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10/072,031	02/08/2002	Katsuhiko Hirabayashi	6920/0K272	2350

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EXAMINER
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SUCHECKI, KRISTYNA

ART UNIT	PAPER NUMBER
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2882

DATE MAILED: 07/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/072,031

Applicant(s)

HIRABAYASHI ET AL.

Examiner

Krystyna Suchecki

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,5,7,8,14,16,18,19 and 23 is/are rejected.
- 7) ☒ Claim(s) 3,4,6,9-13,15,17,20-22 and 24-30 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Specification/Drawings***

1. The lengthy specification and drawings have not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification or drawings.

### ***Claim Objections***

2. Claim 19 is objected to because of the following informalities: "ND" has no definition to give it meaning in the claim. "an a-Si" appears to be a typographical error. Appropriate correction is required.

3. Claims 14-20, 22 and 24-30 are objected to because of the following informalities: The term "thin" is a relative term which renders the claims indefinite. The term "thin" is not defined by the claim. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claim 1-2, 5, 7, 14, 16, 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Gipson (US 4,732,446).

6. Regarding Claims 1 and 7, Gipson teaches a waveguide-type optical device and method comprising: a substrate (10) on which optical waveguides or optical fibers (16) are provided and a trench (14) for dividing optical paths of the optical waveguides or the optical fibers is formed:

Art Unit: 2882

6/20/03  
a pair of electrodes (52) which is assigned (see particulars of connected transmission and reception die in Columns 5-6) ~~assigned to optical signal~~ to each optical waveguide or optical fiber and is formed from the surface of the substrate at both sides of the trench to wall surfaces of the trench ("J" electrode); and a material or device (12) which is filled or inserted into the trench, and which has one of an electro-optic effect, a thermo-optic effect, a light emitting function, a light receiving function, and a light modulating function (44, 46).

7. Regarding Claim 2, Figure 5 of Gipson teaches a waveguide-type optical device as claimed in claim 1, wherein the electrodes are extended by attaching a flexible substrate or by wire bonding (56); and a voltage is applied to the material or device via the extended electrodes.

8. Regarding Claim 5, Gipson teaches a waveguide-type optical device as claimed in claim 1, wherein the material or device which is filled or inserted into the trench is one of a surface-normal optical modulator, a surface light emitting device, and a surface-normal detector which has one of a lightemitting function, a light receiving function, and a light modulating function (44, 46).

9. Regarding Claim 14, Gipson teaches a waveguide-type optical device comprising: a substrate (10) on which optical waveguides or optical fibers (16) are provided and a trench (14) for dividing optical paths of the optical waveguides or the optical fibers is formed; a thin and surface-normal active optical device driven by an applied voltage (12), which is substantially vertically inserted into the trench and is fixed in the trench (Column 2, lines 40-45; Column 7, lines 18-21); and a support member attached to the thin and surface-normal active optical device (38, 30).

Art Unit: 2882

10. Regarding Claim 16, Gipson teaches a waveguide-type optical device as claimed in claim 14, wherein electrodes are formed on the support member, which function as electrodes of the thin and surface-normal active optical device (Column 5, lines 61- Column 6, line 13 and Column 6, lines 56-60).

11. Regarding Claim 18, Gipson teaches a waveguide-type optical device as claimed in claim 16, wherein: the thin and surface-normal active optical device has electrodes; the support member is a rectangular block (38, 30), and L-shaped electrodes are formed on the block in a manner such that the L-shaped electrodes lie on two adjacent faces of the block, where the faces include the top face of the block; and the electrodes of the thin and surface-normal active optical device are respectively connected to the electrodes of the block attached to the device, thereby extending the electrodes of the device to the top face of the block (Column 7, lines 2-6).

*Claim Rejections - 35 USC § 103*

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gipson in view of Wojnarowski (US 5,562,838).

14. Regarding claim 8, Gipson shows a metal layer (electrode) in a trench of an optical device above. He uses a soldering method or conductive epoxy to create the electrode in the trench.

15. Gipson fails to place electrodes in a trench by sputtering or vapor deposition.

Art Unit: 2882

16. Wojnarowski teaches vapor deposition or sputtering of a metal conductive layer (electrode) (226) in a trench (Column 4, lines 31-38 and Column 12). The metal within the trench is taught in conjunction with ablation methods to form a trench with electrical connection to facilitate connections between fibers and electro-optical devices (Column 2, lines 35-38) and in order to improve high density interconnect fabrication by offering an adaptive method for making optical connections to a device on a substrate, especially when the fabrication requires adaptations during the course of the fabrication to allow for mis-alignments or components that are not in predetermined positions (Column 1, lines 8-13 and Summary).

17. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the vapor deposition or sputtering method of Wojnarowski for the metal (electrode) forming step of Gipson since the both seek electrical interconnections between fibers and electro-optic devices. Further benefits to Gipson would be the use of an improved high density interconnect fabrication with an adaptive method for making optical connections to a device on a substrate, even when the fabrication requires adaptations during the course of the fabrication to allow for mis-alignments or components that are not in predetermined positions (Wojnarowski, Column 1, lines 8-13 and Summary).

18. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gipson in view of Kruer (US 4,117,329).

19. Gipson teaches an active optical device above with a detector die (44).

20. Gipson fails to teach the active optical device as a PbS optical detector formed on a glass plate.

Art Unit: 2882

21. Kruer teaches a PbS detector layer formed on a silicon (glass) plate (Particulars of Figure 2). The combination offers resistance to permanent degradation of detector sensitivity due to overexposure to laser irradiation (Column 1). The well know detector material, PbS, benefits from the presence of the glass plate by having enhanced heat dissipation (Column 1).

22. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the detector arrangement of Kruer in the system of Gipson in order to have a detector with enhanced resistance to permanent degradation of detector sensitivity (Kruer, Column 1).

23. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gipson in view of Abe (US 5,757,993).

24. Gipson teaches the use of fibers above. The fibers are coupled to lenses (36).

25. Gipson fails to teach the use of expanded core fibers.

26. Abe teaches expanded core fibers are known expedients to couple light from fibers to functional elements (Column 3, lines 22-24). Abe further teaches benefits of using expanded core fibers with lens systems to be reduced aberrations and reduced precision requirements to optically align fibers (Column 3, lines 51-60).

27. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the expanded core fibers in the system of Gipson as taught by Abe since the known expedients would reduce alignment precision requirements and reduce aberrations (Abe, Column 3, lines 51-60).

Art Unit: 2882

*Allowable Subject Matter*

28. Claims 24-30 would be allowable if rewritten or amended to overcome the objection set forth in this Office action.

29. Claims 3-4, 6, 9-13, 15, 17, 20-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

30. The following is an examiner's statement of reasons for allowance: Claims 3, 6, 11-13 and 20 are allowable for at least the reason that the prior art fails to teach or suggest the material or device inserted into the trench as a liquid crystal as claimed. Wojnarowski teaches a liquid crystal within a trench (Figures 22A-22B), but in the particular embodiment shown, Wojnarowski teaches away from the electrode structure claimed. Claim 4 is allowable for at least the reason that prior art fails to teach a thermo-optic effect material into the trench as claimed. Claims 9 and 10 contain allowable subject matter for at least the reason that while prior art (Wojnarowski) teaches removing polymer material to form a trench and forming electrodes in a trench (as above), and even patterning metallic material directly with a laser (Columns 5-6), <sup>the</sup> prior art does not suggest a motivation to pattern electrodes such as those taught by Gipson within a trench with the methods of Wojnarowski. Further, while inserting a polymer material within a trench is taught in the art, the insertion and removal step of Claim 9 is not taught in conjunction with a subsequent patterning of electrodes on wall surfaces a trench. Claims 15 and 17 are allowable for at least the reason that prior art fails to teach or suggest the dimensions or protrusions as claimed. Claim 21 is allowable for at least the reason that prior art fails to teach or suggest an electrode pattern for polarization control as claimed. Claim 22 is allowable for at least

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Art Unit: 2882

the reason that prior art fails to teach or suggest the PLZT device with trenches, electrodes, adhesives and plates in combination with the trenched, electrode waveguide device as claimed. Claim 24, and therefor dependent claims 25-30 are allowed for at least the reason that prior art fails to teach or suggest the manufacturing method comprising the step of inserting a protruding portion of an active optical device that is supported by a support member into a trench that divides optical paths of waveguides or fibers as claimed.

31. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### *Conclusion*

32. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Patents to (US 6,115,514) (US 6,215,917) and Schaefer (US 5,119,448) are of interest for teaching thermo-optic or other materials inserted within a trench that interrupt waveguide paths. The patents teach passive materials, as in materials that are not associated with electrodes. Application to Romanovsky (US 2002/0172463) is of interest for teaching a waveguide path interrupted by a trench that is filled with a pair of electrodes and an electro-optic material. Romanovsky fails to teach the extension of the electrodes as claimed, or the support member as claimed. Patent to Yamada (US 6,027,254) is of interest for teaching guide posts (65b) inserted into a trench that interrupts waveguide paths. The wire bonding (64) shown, does not suggest the electrodes as claimed. Patent to Minemoto (US 6,008,927) is of interest for teaching an electrode pair and polarization elements interrupting optical paths. The electrodes are not arranged as

Art Unit: 2882

claimed. Application to Katayama (US 2002/0067906) is of interest for teaching a support member with an optical modulator attached thereto, the modulator interrupting optical paths. The modulator is not fixed. Patents to Lebby (US 5,550,941) and Blair (US 6,064,780) are of interest for teaching alternative methods for affixing or forming electrodes such that the electrodes form along two edges of a substrate.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krystyna Suchecki whose telephone number is (703) 305-5424. The examiner can normally be reached on M-F 8-6, with alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Glick can be reached on (703) 308-4858. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4900.

  
ks

June 27, 2003

  
EDWARD J. GLICK  
Supervisor Patent Examiner  
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